coming of the Spaniards: and the idea that it might have been native to both hemispheres is discarded as altogether improbable. Upon this showing, it would appear that the plant should have been set down as of American, rather than of wholly unknown, origin. Indeed, when all the evidence is brought out, the discovery of these beans in the Ancon tombs need excite no more surprise than that of the maize which accompanied them.

For maize, beans, and pumpkins were cultivated together, immemorially, all the way from the Isthmus to Canada. And, although some of the sorts of beans mentioned by Oviedo in 1526, as raised in great abundance in Nicaragua where they are native, and also of those everywhere met with by De Soto (1539–42) in his march from Tampa Bay in Florida to the Mississippi, doubtless belonged to Phaseolus lunatus, yet most if not all of those which at the same early period Jacques Cartier found cultivated by the Indians of Canada, must have belonged to Phaseolus vulgaris, or its dwarf variety P. nanus; for only these are well adapted to the climate of Canada especially the low and precocious variety, which alone has time to mature between the spring and the autumn frosts. Indeed those same beans, derived from the Indians along with maize and pumpkins, have doubtless continued here in New England in direct descent, to form that staple diet for which the northern part of the coast of Massachusetts has long been famous; so that when Rufus Choate, defending a ship-captain against a charge of ill-treatment in having fed his crew exclusively upon it, rehearsed, in his accustomed affluence of language, the praises of "that excellent esculent and superlatively succulent vegetable, the bean," he was celebrating the good qualities of a distinctively and aboriginally American article of food.

We are not to suppose, however, that this species had its home in North America, at least north of Mexico. The same may be said of our squashes and pumpkin, for which similar reclamation may be attempted upon another occasion.

The cultivators of more than one department of science have reason to thank our author for having returned in mature age to the studies of a third of a century ago, and to admire the thoroughness, patience, sound judgment, affluence of knowledge, and felicity of exposition, which characterize this, as indeed they do all his writings. We are well pleased that the first number of our new journal should introduce to the American public an important contribution to science by De Candolle. Asa Gray.

NATURAL HISTORY OF MINNESOTA.

The geological and natural-history survey of Minnesota. The tenth annual report for the year 1881. N. H. Winchell, State geologist. St. Paul: 1882. 254 p., 14 pl. 8vo.

The principal part of this volume consists in the Preliminary list of rocks and Typical thin sections of the rocks of the cupriferous series in Minnesota, articles which appear to be the result of the penurious way in which Minnesota, in common with many other states, deals with her geological survey, compelling the state geologist to do work that ought to be done only by competent skilled lithologists. The results in this case, as elsewhere under similar circumstances in our country, are the same as they would be with paleontology, were the average state geologist compelled to work up all the fossils of his survey. Good lithological work requires something more than a microscope, a few thin sections, and a fair knowledge of minerals.

The convenient summary of opinions which have been held of certain rocks in the Lake-Superior region given on pp. 123–126 appears to be a digest of the more elaborate statements made in Dr. Wadsworth's notes on the geology of this district (Bull. mus. comp. zoöl., vii. No. 1), with additions of a later date, although no credit is given to that writer; on another page of Science, Mr. Selwyn takes exceptions to the views accredited to him, though Mr. Winchell would seem at first sight to be warranted in his statements from Mr. Selwyn's Canadian report of 1877–78, pp. 9 A, 14 A. The execution of the three maps accompanying the Minnesota report is to be praised.

In the zoölogical section of the report, Mr. C. L. Herrick presents a second contribution to a knowledge of the fresh-water Crustacea of the state. In this, as in his first paper (Seventh report, 1878), he limits himself almost entirely to the microscopic Entomostraca. These two papers, with Birge's Notes on Cladocera (of Cambridge, Mass., and Madison, Wisc.), comprise about all the systematic work on these animals done in this country. There is as yet, then, no basis for a discussion of their geographical distribution. According to Mr. Herrick, sixteen out of the thirty-three species described are also European. Thirteen species are new, and two new genera are established. Looking over

the specific descriptions, it appears to us that Mr. Herrick trusts too much to such characters as the number and arrangement of the joints of the antennae, which change with the growth of the individual. Even sexual maturity in these animals does not determine the limit of structural change.

Besides the microscopic forms, two species of cray-fish are recorded, — Cambarus virilis Hagen and C. signifer sp. nov. Attention is again drawn to the curious fact that size does not govern the transition from the 'second form' or sexually immature (?) male to the 'first form' or perfected state; the second form often exceeding the first in its dimensions. Zoölogists whose lot it is to live in a cray-fish country cannot be too strongly urged to study the habits and physiology of these so-called dimorphic males. Types of the 'new' species, C. signifer, kindly communicated by Mr. Herrick, prove to be C. immunis Hagen. Eleven plates accompany this memoir.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

MATHEMATICS.

Quadrature of the circle. — In vol. xx. of the Mathematische annalen, Lindemann gave a proof of the fact that π cannot be a root of an equation of any degree with rational co-efficients. This is a most remarkable paper, as it thus contains the first direct, absolute proof that has ever been given of the impossibility of the quadrature of the circle. M. Lindemann's investigation is based upon, and presupposes a knowledge of, Hermite's earlier paper, in which he showed that e, the Napierian base, cannot be the root of an equation with rational co-efficients. The fact that Lindemann has started from Hermite's results makes his paper rather hard reading; and on this account, the author of the article at present referred to, M. Rouché, has thought it worth while to give an account of the work done by Hermite, and more recently by Lindemann, and at the same time to simplify the processes in both cases. M. Rouché has really done very little in the way of simplification, but by bringing together the proofs he has produced an interesting and valuable paper. He professes the belief that the last word has not yet been said on the subject, but that another and simpler proof will yet be given of the fact that π cannot be a root of any equation of any degree with rational co-efficients. Lindemann has certainly done a splendid piece of work in thus absolutely proving the impossibility of 'squaring the circle;' and it is only to be regretted that his work will not carry conviction to the minds of those mistaken individuals, the 'circle-squarers.' But it is hardly to be supposed that they will be convinced of the futility of their task, any more than the perpetual-motion inventors were convinced by the discovery and enunciation of the principles of the conservation of energy. — (*Nouv. annales*, Jan., 1883.) T. C. [1

Geodesic lines. — The author, Herr A. v. Braunmühl, considers the case of geodesics upon triaxial surfaces of the second order. He derives first Weiertrass' formulas for a general geodesic, and obtains forms for the entering constants in terms of the double *theta*-functions, rendering them easy of computation. Examples are given of the computation of geodesic lines in the general and in several special cases. The latter, and newer part of the paper, contains a derivation of the equations of the envelopes of geodesics, and a discussion of the same. The envelope is determined by aid of the hyperelliptic functions, and special applications are made to the ellipsoid and two sheeted hyperboloid. Numerous references are given to previous investigations. — (*Math. annalen*, xx., 1882.) T. C. [2

Abelian and theta functions. — Prof. Cayley in this memoir has reproduced with additional developments the course of lectures which he delivered in the Johns Hopkins University, in the winter and spring of 1882. The memoir has a special interest as being the first of any consequence upon this subject in the English language, and, indeed, one of the most important in any language. The chief addition to the theory consists in the determination made for the cubic curve, and also (but not as yet in a perfect form) for the quartic curve of the differential expression $d\Pi_{\xi\eta}$ (in Clebsch and Gordan's notation) or $d\Pi_{12}$ (in Prof. Cayley's notation) in the integral of the third kind $\int_a^\beta d\Pi_{\xi\eta}$ in the final normal form for which $\int_a^\beta d\Pi_{\xi\eta} = \int_\xi^\eta d\Pi_{\alpha\beta}$ the limits and parametric points interchangeable. The notation and demonstrations of Clebsch and Gordan are much simplified, and the theory is illustrated by examples, in regard to the cubic, the nodal quartic, and the general quartic respectively. The first three chapters only of the memoir have yet appeared. — (*Amer. journ. math.*, v., 1883.) T. C. [3

PHYSICS.

Acoustics.

Instrument for measuring the intensity of aërial vibrations. — The instrument is based on an experiment described by the author (Lord Rayleigh) in the Proceedings of the Cambridge philosophical society for November, 1880; from which it appeared that a light disk, capable of moving about a vertical diameter, tends to set itself at right angles to the direction of alternating aërial currents. A brass tube is closed at one end with a glass plate, behind which is a slit through which pass rays of light from a lamp. A light mirror with attached magnets, such as are used for reflecting galvanometers, is suspended by a fine silk fibre so that the light from the slit is incident upon it at an angle of 45°, and, after reflection, passes out through the side of the tube by a glass window. A lens is so placed as to throw an image of the slit upon a scale. The opposite end of the tube, prolonged to a distance equal to that between the slit and mirror, is closed by a diaphragm of tissue-paper. A sliding tube extends for some distance beyond this. If the instrument is exposed to sounds whose half-wave-length is equal to the distance from the slit to the tissue-paper diaphragm, nodes are formed at each